

# Plasma Lipid Levels in Patients with Cataract, with and without Pseudoexfoliation Syndrome

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## Abstract

**Purpose:** Pseudoexfoliation syndrome (PES) is an age-related condition characterized by the deposit of an abnormal fibrillar material on many ocular tissues. The current study aimed to assess plasma lipid levels including cholesterol, triglyceride (TG), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL) and high-density lipoprotein (HDL) in patients with cataract, with and without pseudoexfoliation syndrome.

**Methods:** Patients with the diagnosis of senile cataract and indication of surgery were included in the current case-control study. Following the examination, the patients were classified into two groups; the PES group and the non-PES group. From all participants, blood samples were taken after 12 hours of fasting to measure TG, cholesterol, LDL, HDL and VLDL. Mean of plasma lipids were compared between the two groups.

**Results:** Two hundred and fifteen patients with cataract were enrolled in the study in which 74 were diagnosed as having PES (58.1% male) and 141 were non-PES (54.6%) and were selected as control group. Differences between PES and non-PES groups were not statistically significant when considering the mean concentrations of cholesterol, LDL, VLDL and HDL ( $P = 0.899, 0.403, 0.392$  and  $0.878$  respectively). Mean concentration of TG in non-PES group was  $127.07 \pm 6.59$  mg/dL, which was lower than the mean TG of PES group ( $149.78 \pm 6.15$  mg/dL). The difference was statistically significant ( $P = 0.021$ ).

**Conclusions:** The study found that increased TG values were significantly associated with PES. The study results showed that checking and controlling the dyslipidemia in patients with cataract and PES may be helpful. Further studies with larger sample sizes are recommended.

**Keywords:** Pseudoexfoliation Syndrome, Cataract, Plasma Lipids

## 1. Introduction

Cataract, a complete or partial opacification in the human lens or in the capsule, is one of the reversible causes of impaired vision and blindness in the world (1). Cataract surgery is one of the most frequent surgical procedures in older people in both Western and Japanese populations (2, 3). More than 80% of all cataracts are age-related and the pathophysiology behind it is complex and not fully understood (1, 4).

Pseudoexfoliation syndrome (PES) is an age-related condition characterized by the deposit of an abnormal fibrillar material on many ocular tissues and also extraocular organs such as heart, lung, liver, kidney, gall bladder, cerebral meninges, skin, and blood vessels (the walls of small blood vessels). PES prevalence is different according to countries and areas but is reported worldwide (5-8). PES in-

volves all tissues of the anterior segment of the eye and can cause lots of complications. The association between PES and open-angle glaucoma, angle-closure glaucoma and cataract are well established (5, 8, 9). PES is also associated with some systemic disorders such as sensory neural hearing loss, hypertension, cardiovascular and cerebrovascular diseases, transient ischemic attacks, stroke, myocardial infarction and the Alzheimer disease (5, 7, 8). The pathogenesis of PES is not completely defined, but may be related to genetic, environmental and immunologic factors (5).

Dyslipidemia is one of the most important risk factors of cardiovascular disease; it also affects many organs of the body. Dyslipidemia is associated with a wide range of eye diseases, including age-related macular degeneration, glaucoma, retinal vein occlusions and hypertensive and diabetic retinopathy (10, 11). The current study aimed to assess plasma lipid levels including cholesterol, triglyc-

eride (TG), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL) and high-density lipoprotein (HDL) in patients with cataract, with and without pseudoexfoliation syndrome.

## 2. Methods

### 2.1. Study Population

Patients admitted at the ophthalmology department of the Imam Khomeini hospital of Ahvaz University of Medical Sciences from July 2011 till July 2012 with the diagnosis of senile cataract and indication of surgery was included in the current case-control study. The study objectives were explained to the subjects and all the patients signed informed consent before entering the study. Patients characteristics including age and gender were asked. Following the examination, the patients were classified into two groups; the PES group and the non-PES group. All the patients with cataract and PES were included in the case group and twice of that from non-PES group were selected as the control group. Diagnosis of PES was done by standardized clinical examination for signs of the syndrome by slit lamp. Diagnostic criteria were the characteristic grayish-white exfoliative material on the anterior capsule and/or pupillary margin in mydriatic pupil by slit lamp. Also, typical flakes on the iris surface, in either eye were considered as a diagnostic parameter (6, 8). Males and females were eligible to the study. The following subjects were excluded from the study: Patients diagnosed with history of glaucoma, cup/disc ratio more than 0.5, intraocular pressure  $\geq 20$  mmHg, pressure difference between eyes  $\geq 6$ , history of intraocular surgery, ocular trauma, and history of taking any drugs for dyslipidemia such as statins or effective drugs on lipid metabolism. Blood samples of all participants were taken after 12 hours of fasting to measure TG, cholesterol, LDL, HDL and VLDL.

### 2.2. Data Analysis

Statistical analysis was performed using SPSS for windows (Version 16.0, 2007, SPSS Inc, Chicago, IL, USA). The Student T-test (for comparison of means) and Chi-square test (for comparison of gender distribution between the groups) were used. Statistical significance was assessed at the 0.05 probability level in all analyses and the data were given as mean  $\pm$  standard error mean (SE) or frequency.

### 2.3. Ethics

The design of the study was approved by ethics committee of Ahvaz Jundishapur University of Medical Sciences.

## 3. Results

Two hundred and fifteen patients with cataract were enrolled in the study among which 74 were diagnosed with PES and 141 non-PES and were selected as the control group. Of the participants, 120 (55.8%) were male and 95 (44.2%) were female. There was no significant gender wise difference between the case and control groups (58.1% female vs. 54.6% male in case and control groups respectively,  $P = 0.624$ ). The mean age of participants was  $67.01 \pm 0.73$  years; the mean age of case and control groups were  $70.31 \pm 1.26$  and  $56.28 \pm 0.87$  years respectively and the difference was statically significant ( $P = 0.01$ ).

Mean concentration of plasma lipid levels are reported in Table 1. According to Table 1, differences between PES and non-PES groups were not statistically significant when considering the mean concentrations of cholesterol, LDL, VLDL and HDL ( $P = 0.899, 0.403, 0.392$  and  $0.878$ , respectively). Mean concentration of TG in non-PES group was  $127.07 \pm 6.59$  mg/dL, which was lower than that of the PES group ( $149.78 \pm 6.15$  mg/dL). The difference was statistically significant ( $P = 0.021$ ). Table 1 also reports the comparison of means of plasma lipid levels after splitting the study sample into male and female. Results showed no significant differences between case and control groups in none of the plasma lipid levels in female subjects ( $P > 0.05$ ). Also mean of cholesterol, LDL, VLDL and HDL were not statistically different between case and control groups in male participants ( $P > 0.05$ ). But in male subjects, mean concentration of TG was lower in the control group than the case group and the difference was statistically significant ( $118.42 \pm 7.54$  and  $148.87 \pm 8.07$  mg/dL respectively,  $P = 0.014$ ). All participants had cataract.

## 4. Discussion

In recent years, several studies reported the presence of vascular, cardiac and other organ pseudoexfoliative material in patients with ocular pseudoexfoliative (7, 12). The overall current published studies proposed that pseudoexfoliation (PEX) was associated with increased risk of vascular disease; therefore, the investigation for systemic effects of this syndrome attracted more attentions (13, 14). The current study aimed to investigate the plasma lipid levels in patients with cataract, with and without pseudoexfoliation syndrome (PES). The obtained results showed that plasma lipid levels (Chol, TG, LDL and HDL) in both PES and non-PES patients were within normal limits (15). A study conducted by Sabanayagam et al. on assessing the association of metabolic syndrome (MetS) and its five components (including abdominal obesity, elevated blood triglycerides, low HDL cholesterol, high blood pressure

**Table 1.** Comparison of Mean Concentration of Chol, TG, LDL, VLDL and HDL Between Case and Control Groups<sup>a</sup>

Plasma Lipids	PES Group	Non-PES Group	P Value
<b>Chol</b>	192.32 ± 5.64	193.24 ± 4.33	0.899
M	180.70 ± 7.89	185.64 ± 5.97	0.620
F	208.45 ± 6.98	202.39 ± 6.15	0.550
<b>TG</b>	149.78 ± 6.15	127.07 ± 6.59	0.021
M	148.87 ± 8.07	118.42 ± 7.54	0.014
F	150.88 ± 9.52	139.06 ± 11.57	0.459
<b>LDL</b>	124.90 ± 5.86	119.65 ± 3.33	0.403
M	117.58 ± 5.79	120.27 ± 4.75	0.727
F	135.06 ± 11.34	118.90 ± 4.65	0.121
<b>VLDL</b>	28.08 ± 1.41	28.36 ± 1.09	0.792
M	25.60 ± 1.47	24.86 ± 3.93	0.928
F	31.54 ± 2.57	32.59 ± 2.11	0.768
<b>HDL</b>	45.41 ± 2.02	45.70 ± 0.86	0.878
M	47.18 ± 3.25	44.54 ± 1.09	0.353
F	42.96 ± 1.71	47.10 ± 1.36	0.074

Abbreviations: Chol, cholesterol; F, female; HDL, high-density lipoprotein; LDL, low-density lipoprotein; M, male; PES, Pseudoexfoliation syndrome; TG, triglyceride; VLDL, very low-density lipoprotein.

<sup>a</sup>Unit for all data is mg/dL; data are given as mean ± standard error mean.

and diabetes mellitus) with cataract showed that cataract was associated with MetS but not with all its components. Their results showed that age-related cataract was associated high blood pressure and diabetes (16).

The results showed no significant differences between the means of cholesterol, LDL, HDL and VLDL in patients with cataract, with and without PES. But PES group had a significantly higher plasma TG level than non-PES group. Wang et al. in a study to determine the association between dyslipidemia and ocular diseases in Chinese population reported that dyslipidemia was not significantly associated with the prevalence of ocular diseases such as glaucoma, retinal vein occlusions, diabetic retinopathy, age-related macular degeneration, nuclear cataract, cortical cataract and subcapsular cataract (10). Another study conducted by You et al. showed that PES was not associated with gender, diabetes mellitus, blood pressure, dyslipidemia and body mass index (BMI) (17). Kurtul et al. showed that increased LDL levels were significantly associated with PEX (18). In another study, they noted that PEX syndrome was a major risk factor for glaucoma and a coronary artery disease (19). However, the correlation between PEX syndrome and vascular disorders is not obviously demonstrated (20).

In the current study, the difference in the TG levels of female subjects was not statistically significant between pa-

tients with cataract, with and without PES. But male subjects with PES had a higher TG level than those without PES. It means that male patients with cataract and PES may need more care about their plasma lipid levels, especially TG level, comparing females.

#### 4.1. Conclusion

The current study found that Increased TG values were significantly associated with PES. The study results showed that checking and controlling the dyslipidemia in patients with cataract and PES may be helpful. Further studies with larger sample sizes are recommended.

#### References

- Andrikopoulos GK, Alexopoulos DK, Gartaganis SP. Pseudoexfoliation syndrome and cardiovascular diseases. *World J Cardiol.* 2014;**6**(8):847-54. doi: [10.4330/wjc.v6.i8.847](https://doi.org/10.4330/wjc.v6.i8.847). [PubMed: 25228963].
- Drolsum L, Ringvold A, Nicolaissen B. Cataract and glaucoma surgery in pseudoexfoliation syndrome: a review. *Acta Ophthalmol Scand.* 2007;**85**(8):810-21. doi: [10.1111/j.1600-0420.2007.00903.x](https://doi.org/10.1111/j.1600-0420.2007.00903.x). [PubMed: 17376188].
- Ellwein LB. Use of Eye Care and Associated Charges Among the Medicare Population. *Arc Ophthalmol.* 2002;**120**(6):804. doi: [10.1001/archophth.120.6.804](https://doi.org/10.1001/archophth.120.6.804).
- Glacet-Bernard A, Coscas G, Chabanel A, Zourhani A, Lelong F, Samama MM. Prognostic Factors for Retinal Vein Occlusion. *Ophthalmology.* 1996;**103**(4):551-60. doi: [10.1016/s0161-6420\(96\)30653-2](https://doi.org/10.1016/s0161-6420(96)30653-2).
- Grundy SM, Cleeman JJ, Merz CN, Brewer HB, Clark LT, Hunninghake DB, et al. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. *J Am Coll Cardiol.* 2004;**44**(3):720-32. doi: [10.1016/j.jacc.2004.07.001](https://doi.org/10.1016/j.jacc.2004.07.001). [PubMed: 15358046].
- Hiratsuka Y, Yamada M, Akune Y, Murakami A, Okada AA, et al. Cost-utility analysis of cataract surgery in Japan: a probabilistic Markov modeling study. *Jpn J Ophthalmol.* 2013;**57**(4):391-401. doi: [10.1007/s10384-013-0238-8](https://doi.org/10.1007/s10384-013-0238-8). [PubMed: 23588297].
- Kaur J. The Oxidative Stress in Cataract Patients. *J Clin Diag Res.* 2012;**6**(10):1629-32. doi: [10.7860/jcdr/2012/4856.2626](https://doi.org/10.7860/jcdr/2012/4856.2626).
- Kolawole OU, Ashaye AO, Mahmoud AO, Adeoti CO. Cataract blindness in Osun state, Nigeria: results of a survey. *Middle East Afr J Ophthalmol.* 2012;**19**(4):364-71. doi: [10.4103/0974-9233.102741](https://doi.org/10.4103/0974-9233.102741). [PubMed: 23248537].
- Küchle M, Viestenz A, Martus P, Händel A, Jünemann A, Naumann GOH. Anterior chamber depth and complications during cataract surgery in eyes with pseudoexfoliation syndrome. *American Journal of Ophthalmology.* 2000;**129**(3):281-5. doi: [10.1016/s0002-9394\(99\)00365-7](https://doi.org/10.1016/s0002-9394(99)00365-7).
- Quiroga L, Lansingh VC, Samudio M, Pena FY, Carter MJ. Characteristics of the corneal endothelium and pseudoexfoliation syndrome in patients with senile cataract. *Clin Exp Ophthalmol.* 2010;**38**(5):449-55. doi: [10.1111/j.1442-9071.2010.02313.x](https://doi.org/10.1111/j.1442-9071.2010.02313.x). [PubMed: 20456430].
- Sabanayagam C, Wang JJ, Mitchell P, Tan AG, Tai ES, Aung T, et al. Metabolic syndrome components and age-related cataract: the Singapore Malay eye study. *Invest Ophthalmol Vis Sci.* 2011;**52**(5):2397-404. doi: [10.1167/jovs.10-6373](https://doi.org/10.1167/jovs.10-6373). [PubMed: 21228391].
- Praveen MR, Shah SK, Vasavada AR, Diwan RP, Shah SM, Zumkhawala BR, et al. Pseudoexfoliation as a risk factor for peripheral vascular disease: a case-control study. *Eye (Lond).* 2011;**25**(2):174-9. doi: [10.1038/eye.2010.175](https://doi.org/10.1038/eye.2010.175). [PubMed: 21127507].

13. Wang W, He M, Zhou M, Zhang X. Ocular pseudoexfoliation syndrome and vascular disease: a systematic review and meta-analysis. *PLoS One*. 2014;**9**(3):92767. doi: [10.1371/journal.pone.0092767](https://doi.org/10.1371/journal.pone.0092767). [PubMed: [24667689](https://pubmed.ncbi.nlm.nih.gov/24667689/)].
14. French DD, Margo CE, Harman LE. Ocular pseudoexfoliation and cardiovascular disease: a national cross-section comparison study. *N Am J Med Sci*. 2012;**4**(10):468-73. doi: [10.4103/1947-2714.101987](https://doi.org/10.4103/1947-2714.101987). [PubMed: [23112968](https://pubmed.ncbi.nlm.nih.gov/23112968/)].
15. Shingleton BJ, Crandall AS, Ahmed II. Pseudoexfoliation and the cataract surgeon: preoperative, intraoperative, and postoperative issues related to intraocular pressure, cataract, and intraocular lenses. *J Cataract Refract Surg*. 2009;**35**(6):1101-20. doi: [10.1016/j.jcrs.2009.03.011](https://doi.org/10.1016/j.jcrs.2009.03.011). [PubMed: [19465298](https://pubmed.ncbi.nlm.nih.gov/19465298/)].
16. Wang S, Xu L, Jonas JB, You QS, Wang YX, Yang H. Dyslipidemia and eye diseases in the adult Chinese population: the Beijing eye study. *PLoS One*. 2012;**7**(3):26871. doi: [10.1371/journal.pone.0026871](https://doi.org/10.1371/journal.pone.0026871). [PubMed: [22128290](https://pubmed.ncbi.nlm.nih.gov/22128290/)].
17. You QS, Xu L, Wang YX, Yang H, Ma K, Li JJ, et al. Pseudoexfoliation: normative data and associations: the Beijing eye study 2011. *Ophthalmology*. 2013;**120**(8):1551-8. doi: [10.1016/j.ophtha.2013.01.020](https://doi.org/10.1016/j.ophtha.2013.01.020). [PubMed: [23622877](https://pubmed.ncbi.nlm.nih.gov/23622877/)].
18. Kurtul BE, Kurtul A, Altıaylık Ozer P, Kabatas EU, Ertugrul GT. Serum Lipid Levels in Pseudoexfoliation Syndrome. *Semin Ophthalmol*. 2015:1-4. doi: [10.3109/08820538.2015.1068341](https://doi.org/10.3109/08820538.2015.1068341). [PubMed: [26337324](https://pubmed.ncbi.nlm.nih.gov/26337324/)].
19. Andrikopoulos GK, Mela EK, Georgakopoulos CD, Papadopoulos GE, Damelou AN, Alexopoulos DK, et al. Pseudoexfoliation syndrome prevalence in Greek patients with cataract and its association to glaucoma and coronary artery disease. *Eye (Lond)*. 2009;**23**(2):442-7. doi: [10.1038/sj.eye.6702992](https://doi.org/10.1038/sj.eye.6702992). [PubMed: [17932505](https://pubmed.ncbi.nlm.nih.gov/17932505/)].
20. Hollo G. Exfoliation syndrome and systemic cardiovascular diseases. *J Glaucoma*. 2014;**23**(8 Suppl 1):S9-11. doi: [10.1097/IJG.000000000000116](https://doi.org/10.1097/IJG.000000000000116). [PubMed: [25275916](https://pubmed.ncbi.nlm.nih.gov/25275916/)].